

§ 34.30

which the date of manufacture of the individual engine was on or before December 31, 1999:

Oxides of Nitrogen: $(40+2(\text{rPR}))$ grams/kiloneutons rO.

(iv) Engines of a type or model of which the date of manufacture of the first individual production model was after December 31, 1995, or for which the date of manufacture of the individual engine was after December 31, 1999:

Oxides of Nitrogen: $(32+1.6 (\text{rPR}))$ grams/kiloneutons rO.

(v) The emission standards prescribed in paragraphs (d)(1)(iii) and (iv) of this section apply as prescribed beginning July 7, 1997.

(vi) The emission standards of this paragraph apply as prescribed after December 18, 2005. For engines of a type or model of which the first individual production model was manufactured after December 31, 2003:

(A) That have a rated pressure ratio of 30 or less and a maximum rated output greater than 89 kiloneutons: Oxides of Nitrogen: $(19 + 1.6 (\text{rPR}))$ grams/kiloneutons rO.

(B) That have a rated pressure ratio of 30 or less and a maximum rated output greater than 26.7 kiloneutons but not greater than 89 kiloneutons: Oxides of Nitrogen: $(37.572 + 1.6(\text{rPR}) - 0.2087(\text{rO}))$ grams/kiloneutons rO.

(C) That have a rated pressure ratio greater than 30 but less than 62.5, and a maximum rated output greater than 89 kiloneutons: Oxides of Nitrogen $(7 + 2(\text{rPR}))$ grams/kiloneutons rO.

(D) That have a rated pressure ratio greater than 30 but less than 62.5, and a maximum rated output greater than 26.7 kiloneutons but not greater than 89 kiloneutons: Oxides of Nitrogen: $(42.71 + 1.4286(\text{rPR}) - 0.4013(\text{rO}) + 0.00642(\text{rPR} \times \text{rO}))$ grams/kiloneutons rO.

(E) That have a rated pressure ratio of 62.5 or more: Oxides of Nitrogen: $(32 + 1.6 (\text{rPR}))$ grams/kiloneutons rO.

(2) For Class TSS Engines manufactured on or after January 1, 1984:

Hydrocarbons= $140 (0.92)^{\text{rPR}}$ grams/kiloneutons rO.

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(e) Smoke exhaust emissions from each gas turbine engine of the classes specified below shall not exceed:

(1) Class TF of rated output less than 26.7 kiloneutons (6000 pounds) manufactured on or after August 9, 1985

$\text{SN}=83.6(\text{rO})^{-0.274}$ (rO is in kiloneutons) not to exceed a maximum of $\text{SN}=50$.

(2) Classes T3, T8, TSS, and TF of rated output equal to or greater than 26.7 kiloneutons (6000 pounds) manufactured on or after January 1, 1984

$\text{SN}=83.6(\text{rO})^{-0.274}$ (rO is in kiloneutons) not to exceed a maximum of $\text{SN}=50$.

(3) For Class TP of rated output equal to or greater than 1,000 kilowatts manufactured on or after January 1, 1984:

$\text{SN}=187(\text{ro})^{-0.168}$ (ro is in kilowatts)

(f) The standards set forth in paragraphs (a), (b), (c), (d), and (e) of this section refer to a composite gaseous emission sample representing the operating cycles set forth in the applicable sections of subpart G of this part, and exhaust smoke emissions emitted during operations of the engine as specified in the applicable sections of subpart H of this part, measured and calculated in accordance with the procedures set forth in those subparts.

[Doc. No. 25613, 55 FR 32861, Aug. 10, 1990; 55 FR 37287, Sept. 10, 1990, as amended by Amdt. 34-3, 64 FR 5559, Feb. 3, 1999; Amdt. 34-4, 74 FR 19127, Apr. 28, 2009]

Subpart D—Exhaust Emissions (In-use Aircraft Gas Turbine Engines)

§ 34.30 Applicability.

The provisions of this subpart are applicable to all in-use aircraft gas turbine engines certificated for operation within the United States of the classes specified, beginning on the dates specified in § 34.31.

§ 34.31 Standards for exhaust emissions.

(a) Exhaust emissions of smoke from each in-use aircraft gas turbine engine of Class T8, beginning February 1, 1974, shall not exceed a smoke number (SN) of 30.

(b) Exhaust emissions of smoke from each in-use aircraft gas turbine engine

of Class TF and of rated output of 129 kilonewtons (29,000 pounds) thrust or greater, beginning January 1, 1976, shall not exceed

$SN=83.6(rO)^{-0.274}$ (rO is in kilonewtons).

(c) The standards set forth in paragraphs (a) and (b) of this section refer to exhaust smoke emissions emitted during operations of the engine as specified in the applicable section of subpart H of this part, and measured and calculated in accordance with the procedure set forth in this subpart.

Subparts E–F [Reserved]

Subpart G—Test Procedures for Engine Exhaust Gaseous Emissions (Aircraft and Aircraft Gas Turbine Engines)

§ 34.60 Introduction.

(a) Except as provided under § 34.5, the procedures described in this subpart shall constitute the test program used to determine the conformity of new aircraft gas turbine engines with the applicable standards set forth in this part.

(b) The test consists of operating the engine at prescribed power settings on an engine dynamometer (for engines producing primarily shaft power) or thrust measuring test stand (for engines producing primarily thrust). The exhaust gases generated during engine operation must be sampled continuously for specific component analysis through the analytical train.

(c) The exhaust emission test is designed to measure concentrations of hydrocarbons, carbon monoxide, carbon dioxide, and oxides of nitrogen, and to determine mass emissions through calculations during a simulated aircraft landing-takeoff cycle (LTO). The LTO cycle is based on time in mode data during high activity periods at major airports. The test for propulsion engines consists of at least the following four modes of engine operation: taxi/idle, takeoff, climbout, and approach. The mass emission for the modes are combined to yield the reported values.

(d) When an engine is tested for exhaust emissions on an engine dyna-

meter or test stand, the complete engine (with all accessories which might reasonably be expected to influence emissions to the atmosphere installed and functioning), shall be used if not otherwise prohibited by § 34.62(a)(2). Use of service air bleed and shaft power extraction to power auxiliary, gearbox-mounted components required to drive aircraft systems is not permitted.

(e) Other gaseous emissions measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator or the Administrator of the EPA.

[Doc. No. 25613, 55 FR 32861, Aug. 10, 1990, as amended by Amdt. 34-3, 64 FR 5559, Feb. 3, 1999]

§ 34.61 Turbine fuel specifications.

For exhaust emission testing, fuel that meets the specifications listed in this section shall be used. Additives used for the purpose of smoke suppression (such as organometallic compounds) shall not be present.

SPECIFICATION FOR FUEL TO BE USED IN AIRCRAFT TURBINE ENGINE EMISSION TESTING

Property	Allowable range of values
Density at 15 °C	780–820.
Distillation Temperature, °C 10% Boiling Point	155–201.
Final Boiling Point	235–285.
Net Heat of Combustion, MJ/Kg	42.86–43.50.
Aromatics, Volume %	15–23.
Naphthalenes, Volume %	1.0–3.5.
Smoke point, mm	20–28.
Hydrogen, Mass %	13.4–14.1.
Sulfur Mass %	Less than 0.3%.
Kinematic viscosity at –20 °C, mm ² /sec ..	2.5–6.5.

[Doc. No. FAA-1999-5018, 64 FR 5559, Feb. 3, 1999]

§ 34.62 Test procedure (propulsion engines).

(a)(1) The engine shall be tested in each of the following engine operating modes which simulate aircraft operation to determine its mass emission rates. The actual power setting, when corrected to standard day conditions, should correspond to the following percentages of rated output. Analytical correction for variations from reference day conditions and minor variations in actual power setting should